The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An A and/or A' site deficient perovskite of general formula of $(A_{1-x}A'_x)_{1-y}FeO_{3-\delta}$ or of general formula $A_{1-x-y}A'_xFeO_{3-\delta}$, wherein A is La alone or with one or more of the rare earth metals or a rare earth metal other than Ce alone or a combination of rare earth metals and X is in the range of from 0 to about 1; A' is Sr or Ca or mixtures thereof and Y is in the range of from about 0.01 to about 0.3; δ represents the amount of compensating oxygen loss, and wherein if either A or A' is zero the remaining A or A' is deficient.

2. The perovskite of claim 1, wherein X is in the range of from about 0.1 to about 0.4.

3. The perovskite of claim 1, wherein A' is present in the range of from about 0.15 to about 0.30.

4. The perovskite of claim 1, wherein A is La and one or more of Ce, Pr, Nd, Sm, Gd, and Y.

5. The perovskite of claim 1, wherein A is La and one or more of Ce, Pr, and Nd.

6. The perovskite of claim 1, wherein A is at least 60% La.

7. The perovskite of claim 1, wherein A is substantially all La.

8. The perovskite of claim 1, wherein A' is Sr.

9. The perovskite of claim 1, wherein the A and/or A' site deficiency is in the range of from about 5 mole % to about 30 mole %.

10. The perovskite of claim 1, wherein the A and/or A' site deficiency is in the range of from about 10 mole% to about 20 mole %.

11. The perovskite of claim 1, wherein the area specific resistance (ASR) is less than about 0.2 ohms.cm^2 at 800° C.

12. The perovskite of claim 1, wherein A is at least 60% La present at about 0.6 mole fraction and A= is Sr present at about 0.25 mole fraction.

13. The perovskite of claim 1, wherein the perovskite is substantially single phase.

14. The perovskite of claim 1, functioning as an anode or a cathode adjacent to and in contact with a solid electrolyte.

15. The perovskite of claim 1 in the form of a membrane and further including mechanism for establishing an oxygen partial pressure gradient across said membrane.

16. The perovskite of claim 1 in the form of an electrode in combination with an oxygen ion conducting membrane.

17. A cathode material of an A and/or A' site deficient perovskite of general formula of $A_{1-x-y}A'_xFeO_{3-\delta}$, wherein A is La alone or with one or more of the rare earth metals or a rare earth metal other than Ce alone or a combination of rare earth metals and X is in the range of from about 0.1 to about 0.4; A' is Sr or Ca or mixtures thereof and Y is in the range of from about 0.01 to about 0.3; δ represents the amount of compensating oxygen loss, wherein the A and/or A' site deficiency is in the range of from about 5 mole% to about 30 mole%, and wherein if either A or A' is zero the remaining A or A' is deficient.

18. The perovskite of claim 17, wherein A is La and one or more of Ce, Pr, Nd, Sm, Gd, and Y.

19. The perovskite of claim 17, wherein A is La and one or more of Ce, Pr, and Nd.

20. The perovskite of claim 17, wherein A is at least 60% by weight La.

21. The perovskite of claim 17, wherein A is substantially all La.

22. The perovskite of claim 17, wherein A' is Sr.

23. The perovskite of claim 22, wherein A' is present in the range of from about 0.15 to about 0.30.

24. The perovskite of claim 23, wherein the A and/or A' site deficiency is in the range of from about 10 mole % to about 20 mole %.

25. The perovskite of claim 24, wherein the area specific resistance (ASR) is less than about 0.2 ohms.cm^2 at 800° C.

26. The perovskite of claim 25, wherein A is at least 60% by weight La present at about 0.6 mole fraction and A' is Sr present at about 0.25 mole fraction.

27. The perovskite of claim 17, wherein A is at least 60% La, A= is Sr, Y is in the range of from about 0.05 to about 0.3 and the perovskite is substantially single phase.

28. A solid oxide fuel cell, comprising an anode and a cathode separated by a solid electrolyte, said cathode including an A and/or A' site deficient perovskite of general formula of $(A_{1-x}A'_x)_{1-y}FeO_{3-\delta}$ or of general formula $A_{1-x-y}A'_xFeO_{3-\delta}$, wherein A is La alone or with one or more of the rare earth metals or a rare earth metal other than Ce

alone or a combination of rare earth metals and X is in the range of from about 0 to about 1; A' is Sr or Ca or mixtures thereof and Y is in the range of from about 0.01 to about 0.3; δ represents the amount of compensating oxygen loss, and wherein if either A or A' is zero the remaining A or A' is deficient.

29. The solid oxide fuel cell of claim 28, wherein the electrolyte is one or more of yttria stabilized zirconia, doped ceria, doped lanthanum gallate, and doped bismuth oxide.

30. The solid oxide fuel cell of claim 28, wherein the electrolyte is yttria stabilized zirconia.

31. The solid oxide fuel cell of claim 30, wherein the area specific resistance (ASR) of the cathode is less than about 0.2 ohms.cm^2 at 800° C..

32. The solid oxide fuel cell of claim 31, wherein A is at least 60% La and X is in the range of from about 0.1 to about 0.4 and A' is Sr.

33. The solid oxide fuel cell of claim 32, wherein A is at least 60% La present at about 0.6 mole fraction and A' is Sr present at about 0.25 mole fraction.

34. The solid oxide fuel cell of claim 33, wherein the cathode is substantially single phase.

35. A stack of a plurality of the solid oxide fuel cells of claim 28, wherein each fuel cell is separated from an adjacent fuel cell by an interconnect material and at least some of the cells are connected in series.

36. The stack of claim 35, wherein at least some of the cathodes are A and/or A' site deficient, A is at least 60% La, X is in the range of from about 0.1 to about 0.4 and A' is Sr.